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JUNIPERUS SCOPULORUM AS A HOST.*

BY RALPH HOPPING,

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During the author's collecting in the southwest, extending over a period of approximately thirty years, various species of the genus *Phloeosinus* have been found breeding in the cedar-like types of the genera *Sequoia*, *Thuja*, *Libocedrus* and *Juniperus*.

It is quite often the case that two or three species will be found in the same tree. *Libocedrus decurrens* is often attacked on the trunk by *P. punctatus* Lec., in the limbs by *P. vandykei* Sw. and in the small twigs by *P. hoppingi* Sw., *Juniperus occidentalis* frequently has *P. juniperi* Sw. attacking the trunk and *P. rugosus* Sw. the limbs. In British Columbia *Juniperus scopulorum* is attacked by species of the same genus, but for three years I was unable to find any freshly killed trees, although individual trees killed several years previous to examination were frequently found.

In 1921 while at Williams Lake on the Cariboo Road with Mr. Ronald Buckell of the Dominion Entomological Branch, we succeeded in obtaining a few specimens of *Phloeosinus* from a small tree cut by surveyors. Two of these specimens, taken from twigs, proved to be *Phloeosinus hoppingi* Sw., the first record of the species north of California.

The other specimens belonged to an unknown species. In order to obtain a better series of this new species, a tree of *Juniperus scopulorum* was cut near the Canon House about thirty miles west of Princeton, B. C. and not far north of the International Boundary.

This tree, about 6", D. B. H., was cut on May 20, 1922, and left until July 1 to become infested. On that date three pieces, from three to four inches in diameter and about three feet long, were brought to the Vernon Laboratory and caged, awaiting the emergence of the beetles.

From the deposits of sawdust it was soon realized that the infestation consisted not only of the bark-beetle, *Phloeosinus*, but also of a cerambycid borer, which finally proved to be Col. Casey's *Callidium californicum*. The *Phloeosinus* has since been described by Dr. J. M. Swaine as *Phloeosinus scopulorum*.

Phloeosinus scopulorum Sw. emerged in August 1922 and *Callidium californicum* Csy. in February, March and April 1923. If these logs had been caged in the open no doubt the emergence would have occurred between two and three weeks later. However, the tables give a very fair idea of the peak of each emergence, the total extent and the dates between which the average emergence occurred.

*—Contribution from Division of Forest Insects, Entomological Branch, Department of Agriculture, Ottawa, Ont.

EMERGENCE OF *CALLIDIUM CALIFORNICUM* CSY. 1923.

Date of emergence	No. emerged	Remarks
Feb. 7.....	3	Two, warm
Feb. 8.....	4	Sunshine
Feb. 9—Mch. 7.....	none	Cold and cloudy
Mch. 8.....	25	Sunshine
Mch. 9—Mch. 21.....	none	Cold and cloudy
Mch. 13.....	13	Sunshine
Mch. 14—Mch. 21.....	none	Cold and cloudy
Mch. 22.....	31	Sunshine
Mch. 26.....	46	From March 26
Mch. 27.....	11	to
Mch. 28 to Mch. 29.....	32	the end of
Mch. 30.....	31	April
Mch. 31.....	none	the days
April 1.....	8	were more
Apl. 2—Apl. 3.....	12	or less
Apl. 4.....	31	sunny and
Apl. 5.....	37	warm
Apl. 6.....	12	
Apl. 7—Apl. 22.....	46	approx. 3 per day
Apl. 23.....	16	
Apl. 24.....	7	
Apl. 25—Apl. 26.....	6	
Apl. 27.....	2	
Total	373	

Although the laboratory was uniformly warm during the day it would appear that sunlight influenced the emergence of *Callidium californicum*, but not the emergence of the barkbeetle *P. scopulorum*.

EMERGENCE OF *PHLOEOSINUS SCOPULORUM* SW. 1922.

Date of emergence	No. emerged	Remarks
Aug. 9.....	28	Sunshine
Aug. 10.....	48	Sunshine
Aug. 11.....	7	Cloudy and rainy
Aug. 13.....	47	Cloudy
Aug. 14.....	93	Hot sunshine
Aug. 15.....	34	Cloudy
Aug. 16.....	15	Hot sunshine
Aug. 17.....	26	Hot sunshine
Aug. 18.....	4	Cloudy
Aug. 19.....	3	Rainy
Aug. 20.....	none	Cloudy
Aug. 21.....	6	Hot sunshine
Aug. 22.....	11	"
Aug. 23.....	3	"
Aug. 24.....	1	"
Aug. 25.....	3	"
Aug. 26.....	none	"
Aug. 27.....	none	"
Aug. 28.....	1	"
Aug. 29.....	1	"
Aug. 30.....	none	Cloudy
Aug. 31.....	none	Cloudy
Sept. 1.....	none	Hot sunshine
Total	331	

It will be seen that 373 *Callidium californicum* and 331 *Phloeosinus scopulorum* emerged from these three small sticks cut and left on the ground, or a total emergence of 704 injurious beetles, a very good illustration of what slash will produce if not taken care of and burned at the proper time. *Juniperus scopulorum* is, of course, not an important, nor a commercial tree in British Columbia, but the tremendous emergence is indicative of what may be expected in slash from other species.

THE LIFE HISTORY OF VELIA WATSONI DRAKE (HETEROPTERA, VELIIDAE).*

BY WILLIAM E. HOFFMAN,
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During the month of September, 1922, while collecting aquatics in Neosho County, Kansas, several specimens of *Velia watsoni* Drake were taken by Mrs. Grace Wiley and the writer. These bugs were taken in some stagnant pools in the bed of a small stream. The stream is a small tributary of Big Turkey Creek and enters that stream at a point a couple of miles south of Chanute, Kansas. The stream was dry except for here and there an occasional pool. The pools were bordered with a great mass of smartweed, and other weeds and grasses and it was among the roots of these, on the moist bank that most of the specimens were taken. Both fifth-stage nymphs and adults, representing both sexes, were taken. This meant a noteworthy extension of the known distribution of the species as it had heretofore been recorded only from Florida, the type locality. Realizing that we did not have life history notes for this or any other American *Velia*, it was decided to take the specimens alive and attempt to rear them. As a matter of fact, as far as the writer has been able to ascertain, we do not have the complete life history of any *Velia*, domestic or exotic. Mr. E. A. Butler in "A Biology of the British Hemiptera-Heteroptera", 1923, has given us the description of the nymphal stages of the European *Velia currens* Fabr., but the species was not reared. Nymphs of five apparently distinct stages were collected in the field as the season advanced and it was therefore concluded that this species had five nymphal stages. Definite data were not obtained as to the duration of the various stages. It has been said that the American *Velias* dwell on moving waters, but Drake points out in his description of *V. watsoni* that this species inhabits stagnant water. Such was found to be the case with the specimens taken in Kansas, while the same is true of *Velia brachialis* Stal., of which numerous specimens were taken on stagnant water in Texas by Mrs. Grace Wiley. Texas, by the way, is a new locality for that species.

The *Velias* were placed in tin boxes with damp vegetation. Mrs. Wiley had little trouble keeping the bugs in captivity and in due time the nymphs transformed to adults. Some months later Mrs. Wiley moved from Chanute, Kansas to St. Paul, Minnesota, and successfully brought her *Velia* family along with her.

During February of 1923 the *Velias* were taken over by the writer and during the summer a number of nymphs were reared to maturity. Beginning with February of this year, nymphs have been secured not only from adults reared last summer but also from the original adults collected in 1922.

MATING. Mating has taken place in captivity during every month of the year, but has been more frequent during the warmer part of the season. Mating also took place more frequently during the night than through the day. While specimens have been observed in copula, the male was never actually caught in the process of mounting the female except when a male and female, both of which had been isolated for some time, were placed together. On these occasions mating took place immediately. The male approached the female at right angles to the side of her body; when mounted he immediately righted

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himself, moved back a trifle and immediately made connection. The male either mounts slightly to the right or the left, causing his body to lie slightly diagonal to the body of the female. At times they were perfectly motionless while in copula, while at other times the female walked leisurely about. At times the male stroked the head and pronotum of the female with his rostrum. Once or twice during copulation the males have been observed to reach forward with the intermediate legs and draw the antennae of the female backward until the last three antennal segments were at right angles to the first. In this respect they remind one of the mating of *Microvelia fontinalis* Bueno. In *M. fontinalis* the male repeatedly draws the antennae of his mate backward and upward, the intermediate legs are used for the purpose and are pressed against the outer sides of the antennae near their bases. Soon after the mating of *V. watsoni* has begun, the specimens may be removed in coitu from the life history jar to another, but after mating has been in progress for some time they are rather easily disturbed. Occasionally mating has been observed on the side of a glass vessel but for the most part it is accomplished on the surface of the water. Just how long a pair will remain in mating without intermission I cannot say, but I know it is upwards of two hours.

OVIPOSITION. Drake (Florida Buggist, June, 1919.) says: "The eggs are deposited on floating aquatic plants and floating sticks of wood just beneath the surface of the water." In the aquarium the writer has found them to deposit eggs on the side of the glass container and on rocks, as well as upon floating objects. Eggs have been deposited in the laboratory during every month but December, with the peak of production occurring during August and September.

INCUBATION. The incubation period is about twelve days at room temperature. About two days before hatching the red eye-spots and the black egg-burster appear. During the next forty-eight hours these increase in distinctness and the rest of the egg darkens. A few hours before hatching the egg appears quite black and legs and antennae can be outlined through the egg shell.

HATCHING. Although dozens of eggs have been hatched in the laboratory, the entire hatching process has never been observed. The egg was split longitudinally across one end and for two-thirds the length of the egg. The nymph emerged head first with the ventral side up and emerged fairly rapidly in most instances.

FECUNDITY. One female laid over 140 eggs in 128 days, thus averaging a little better than an egg a day for the period. Another female deposited 100 eggs in 155 days or an average of a fraction less than an egg per one and one-half days. The daily number of eggs deposited by the female varied from none to seven, (a number observed but once). One, two or three eggs were the usual number deposited and often a day or so would pass without any eggs being deposited. Both of the above mentioned females had laid eggs before the count was started as they were at first kept in a container with two other females; also the count was made by counting the nymphs, so any infertile eggs would be thus overlooked. In this common container the first eggs were deposited on February 16th, while the females in question were not isolated until May 8 and May 13th. The female laying 140 eggs between the dates of May 11th and

September 16th, 1923, did not lay more eggs until February 8th, 1924. During the remainder of February and the month of March she has deposited 31 eggs. The female laying 100 eggs between the dates of May 23rd and October 25th, 1923, took a winter rest until January 3rd, 1924, when she laid three eggs. Two more were laid during February and fifteen during the month of March.

LONGEVITY. Four of the specimens taken in Kansas in 1922 are still alive and thriving. These are over eighteen months old and thus reproducing for their second season. Since both nymphs and adults were originally taken it might be supposed the adults had only recently reached maturity but this does not necessarily hold true as there is undoubtedly a long egg-laying period as found to be the case under laboratory conditions. Indeed it is possible that there could be two generations in the latitude of Kansas. It might also be supposed that the first ones to die of the original stock were the oldest ones, but this does not necessarily follow as some of the *Velias* reared last summer and kept under precisely the same conditions as the ones under discussion have now been dead several months. It is evident that *Velia watsoni* is a long-lived bug. It is true that with regular food and no danger from the weather or enemies to contend with the chances for longevity have been greatly enhanced. On the other hand, having been kept at room temperature, they have been active throughout two winters, while in nature they would have gone into hibernation. Possibly they do not age as fast while hibernating as when leading an active life.

NUMBER OF INSTARS. There are five nymphal stages.

MOLTING. Molting usually took place on the surface of the water although it sometimes occurred on the straight side of the glass container. Previous to molting the nymph appeared somewhat bloated and became less active. It also turned darker before molting. The changes were the same for all of the instars, but were more pronounced in the later ones. Individual variation was detected in regard to the degree of inactivity or sluggishness and also in the intensity of the discoloration. The actual molting process was very much like that which takes place in *Gerris* and *Microvelia*.

MATURITY. To all appearances the bug is mature in a short time after the last molt, or by the time its normal color has developed. However, recently emerged adults of the opposite sexes paid no attention to each other, and no specimens have been observed to mate in less than two weeks after becoming adult. Since they remain in copula for long periods, and because of their mating with marked regularity, it is not likely that all of the observations were made just at the time when they were not mating. At the present time I have before me a male and female, both of which reached maturity over a week ago. The specimens have been under almost constant attention, excepting from midnight to 7.00 a.m., and have not been observed to mate. The shortest preoviposition period thus far observed was 22 days.

FOOD HABITS. Dr. Drake says the species is predaceous. I have not only found it to be predaceous but cannibalistic as well. The adults will kill the nymphs, and the nymphs will kill each other. Many specimens have been sacrificed in order to determine if it were possible to rear more than one nymph in a life history jar and I am satisfied that it cannot be done. Quantities of choice food may be present in the life history cage but that does not deter them in the

least. Consequently it is necessary to remove the adults to new containers as fast as eggs are ready to hatch. *Velia brachialis* Stal was found to differ in this respect, for a number of nymphs, or even a number of both nymphs and adults have been kept in the same aquarium with little danger of cannibalism developing.

Velias like the Microvelias fed upon the very small animals swimming beneath the surface film as well as upon food articles on the surface. The Velias were very leisurely in their feeding habits, as indeed they were in all of their activities. Their every move was deliberateness personified.

They fed on living, crippled, or dead insects placed on the surface of the water. The adults did well on any insect food, while the nymphs seemed to thrive better on cockroach nymphs than upon any other food. Many nymphs were reared from hatching to maturity on a straight diet of cockroaches. The adults have been fed on flies, nymphs and adults of Cicadellids, Cercopids and Mirids, grasshopper nymphs, adult *Tribolium*, *Bruchus*, *Dermestes*, and larval forms such as *Tenebrio*, Mediterranean flour moth and various caterpillars.

BEHAVIOR. Little opportunity was had to study this form afield. Most of the specimens secured were taken on the moist bank several inches from the water's edge. They were found under a dense growth of vegetation on the surface of the water after beating the vegetation nearby. In captivity the adults remain inactive for long periods at a time and sometimes can be aroused only after considerable prodding with a forceps. In their movements upon water they remind one very much of spiders. They were readily turned upside down, a slight lift of the forceps or a little puff of wind accomplishing this very easily. Since these bugs will respond to a slight puff of air by drawing in their antennae and legs, the person rearing them can very readily tell whether his specimens are dead or alive. They seemed to be actually asleep much of the time. Dead specimens in the aquarium have been mistaken for the living but inactive bug, and death not discovered until some days later, when in most cases the specimens were no longer fit for mounting. This inactivity probably accounts for their reaction to food, as they seemed never to be eager for food. They certainly differed from *Microvelia*, *Gerris* and *Trepobates* in this respect, as these forms seemed always to be hungry. They were not easily frightened and therefore one could study them at ease. The nymphs, on the other hand, were more active. *Velia brachialis* Stal behaved very much like this species, except that it was more active.

DESCRIPTION OF STAGES

EGG. Length, .8 mm.; greatest width, .3mm.; elongate-oval and tapering at both ends. Creamy yellow when first deposited but turning brown shortly afterward. The eggs are fastened to their supports by means of a mass of translucent mucilaginous material.

FIRST INSTAR. Nymph about one day old measured dorsally as follows: length along median line, .826 mm.; width of head across eyes, .280 mm.; width across thorax, .396 mm.; greatest width of abdomen, .330 mm. The color is gray and brown. Dorso-lateral portions of head and thorax brown. Two gray lines before the eyes merge into a larger gray line on top of the head between the eyes. This extends along the median line to the tip of the abdomen. The median gray line enlarges into a spot on the head, and another on the prothorax and meso-

thorax. Beginning with the metathorax the line diminishes in width until it is very narrow at the tip of the abdomen. The metathorax and the first abdominal segment are brown for the entire dorsal surface save the median line. The remaining abdominal segments have a brown stripe on either side of the aforementioned grayish median line, extending half way across the width of the abdomen. The second and third antennal segments as well as the fourth are brown, the rest gray. Distal one-half of femora, all of tibiae and tarsi brown except a dark gray spot near the distal end of femora and a spot on tibiae near the middle. Remainder of legs and underside of body grayish white in color.

SECOND INSTAR. Nymph which had been in the second instar one day, measured dorsally as follows; length along median line, 1.434 mm.; width of head across eyes, .332 mm.; width of thorax, .528 mm.; greatest width of abdomen, .513 mm. Gray spot on head smaller in proportion; prothorax entirely brown except for a gray median line; median gray line of metanotum has widened and now appears marked like the prothorax of the second instar. First abdominal segment marked with brown, the rest of the abdomen presenting a mottled gray appearance; the fourth and fifth segments noticeably dark gray in appearance. Antennae brown except basal two-thirds of first segment. Legs marked as in the preceding stage.

THIRD INSTAR. A nymph which has been in the third instar for two days measured dorsally as follows: length along median line, 1.88 mm.; width of head across eyes, .422 mm.; greatest width of thorax, .679 mm.; greatest width of abdomen, .588 mm. Dark patch on head shows a median line of lighter color. Pronotum now has lighter lines near its outer edges which extend nearly to the base and then go at right angles to join the pale median line, thus marking off two nearly quadrangular shaped areas of brown. Rest of body much the same as for the second instar. The legs now have an additional gray spot on the femora and tibiae. The so-called wing pads surely make one expect a winged adult at the time of the last molt.

FOURTH INSTAR. Measurements taken from a nymph two days in the fourth instar: length along median line, 2.52 mm.; width of head across eyes, .528 mm.; greatest thoracic width, .906 mm.; greatest abdominal width, .770 mm. Abdominal segments one, three, and four decidedly gray, especially the first segment.

FIFTH INSTAR. Measurements taken from a nymph nine days in the fifth instar; length along median line, 3.216 mm.; width of head across eyes, .604 mm.; greatest thoracic width, .921 mm.; greatest abdominal width, .815 mm. General markings about the same as for fourth instar. Pronotum greatly developed.

RECORD OF REARINGS OF VELIA WATSONI DRAKE

Rearing number	First instar	Second instar	Third instar	Fourth instar	Fifth instar	Total days	Sex	Date
5	8	6	6	6	8	34	♂	Aug. 23, 1923
6	5	7	4	5	9	30	♀	June 15
7	5	6	3	6	8	28	♀	June 17
8	5	5	3	6	8	27	♀	June 17
9	7	3	6	6	6	28	♀	June 21
10	4	4	6	5	5	24	♀	June 21
11	4	3	6	5	6	24	♂	June 21

12	3	3	5	6	5	22	♀	June 20
13	4	3	6	5	6	24	♀	June 22
14	5	3	6	5	6	25	♂	June 22
16	5	5	3	4	6	23	♂	June 30
17	5	2	8	5	6	26	♀	July 13
18	6	5	4	6	7	28	♂	July 7
19	5	3	4	6	7	25	♂	July 9
20	4	5	2	7	8	26	♂	July 10
21	4	7	3	6	5	25	♂	July 10
22	10	7	4	5	6	32	♂	July 17
23	6	8	5	4	6	29	♂	July 15
24	5	5	3	4	7	24	♀	July 19
25	7	6	3	4	7	27	♀	July 20
26	7	5	3	6	6	27	♂	July 24
27	8	3	3	5	8	27	♂	July 24
28	8	4	3	5	7	27	♂	July 24
29	8	3	3	7	6	27	♀	July 24
30	5	6	5	5	9	30	♀	July 1
31	5	3	3	4	5	20	♂	July 20
32	3	3	3	7	8	24	♂	July 29
34	5	4	4	5	8	26	♀	Aug. 1
380	5	6	8	8	10	37	♀	Oct. 7
381	7	7	7	5	10	36	♀	Oct. 8
4-72	5	6	5	6	8	30	♂	Mar. 23, 1924
4-83	5	6	6	6	9	32	♂	Mar. 25
4-102	7	4	6	5	9	31	♀	Mar. 29
Average	5.6	4.7	4.4	5.4	7.1	27.1		
Minimum	3	2	2	4	5	20		
Maximum	10	8	8	8	10	34		

Proportion of sexes: Males 14, Females 19.

SUMMARY. It may be observed from the table that 33 specimens were reared to maturity. Of this number 14 were males and 19 females. The average length of the first instar was 5.6 days (minimum 3, maximum 10 days); average length of the second instar was 4.7 days (minimum 2, maximum 8 days); average length of the third instar was 4.4 days (minimum 2, maximum 8 days); average length of the fourth instar was 5.4 days (minimum 4, maximum 8 days); average length of the fifth instar was 7.1 days (minimum 5, maximum 10 days). The average span of nymphal life was 27.1 days with a minimum time of 20 days and a maximum period of 34 days. Adding the twelve days (average length of the incubation period) we have a total developmental period ranging from 32 to 46 days, the average being 29.1 days. Two principal factors have operated to cause variation in length of developmental periods, namely temperature and individual variation. The containers were for the most part identical and the food was the same. The humidity was practically uniform for all the rearings. Individual variation certainly manifests itself, for with all environmental factors essentially alike, variation still exists. In these rearings, individual variation has been augmented by differences in temperature, as a later paper will point out.

NOTES ON COLEOPTERA

BY A. B. CHAMPLAIN AND J. N. KNULL,
Harrisburg, Pa.

The following collection of miscellaneous notes are presented as contributions to our knowledge of certain species of Coleoptera from original observations and rearings.

SILPHIDÆ

Genus *Silpha*—They are predaceous as well as carrion feeders, all of the

local species were observed feeding on Dipterous larvae.

CLERIDAE

Monophylla terminata Say.—Reared June 4, from apple infested with *Scolytus rugulosus* Ratz., at Chambersburg, Pa.

Enoclerus quadriguttatus Oliv.—Reared from apple branches infested with *Scolytus rugulosus* Ratz., collected at Chambersburg, Pa.

BUPRESTIDAE

Chalcophorella campestris Say.—Found breeding in dead fallen linden (*Tilia americana*) wood at Harrisburg, Pa.

Trachykele lecontei Gory.—Two living adults of this rare species were taken from pupal cells in dead cypress (*Taxodium distichum*) on Sept. 13th at Cape Henry, Va. This indicates that at least a part of the adults which appear in the spring mature the previous fall and pass the winter in their pupal cells.

Dicerca pugionata Germ.—Healthy ninebark (*Opulaster opulifolius*) was found being attacked by this species at Chambersburg, Pa. Many of the plants had been killed by the insect.

Buprestis maculipennis Gory.—Reared from dead bald cypress (*Taxodium distichum*) wood collected at Cape Henry, Va.

Xenorhipis brendeli Lec.—An adult of this rare species was captured on a dying honey locust (*Gleditsia triacanthos*) at Columbus, Ohio, on July 29.

Anthaxia quercata Fab.—Reared May 31 from dead black oak branches collected at Caledonia, Pa.

Agrilus difficilis Gory.—Was found breeding in dead honey locust (*Gleditsia triacanthos*) at Columbus, Ohio. Adults were found in numbers basking in the sunshine on a dying tree in July and August.

Agrilus politus Say.—Adults were reared from galls on *Corylus* collected at Hummelstown, Pa.; also from galls on willow collected at Chambersburg, Pa. The galls on *Corylus* from Pennsylvania referred to in Canadian Entomologist, page 85, 1922, proved to be the work of this species and not *A. coryli* Horn.

CUCUJIDAE

Dysmerus basalis Casey.—Adults of this species, both males and females were found in considerable numbers beneath the bark of dying poison ivy, *Rhus toxicodendron* at Hummelstown, Pa., March 3. Dr. E. A. Schwarz of the U. S. National Museum, to whom they were shown, remarked that he found the species beneath the bark of poison ivy in the District of Columbia. The species was described from a unique specimen collected by Dr. Schwarz in Florida. The form of the second antennal joint of certain specimens which we supposed were males, are strikingly different from anything we had ever seen, and attracted our attention. Other specimens were normal in this respect and resembled *Laemophloeus*.

COLYDIIDAE

Aulonium—These beetles and their larvae are probably predators, for we have fed them on Scolytid larvae in cages and find them in connection with bark boring larvae in trees. The adults are crepuscular in their habits.

Aulonium parallelopipedum Lec.—Philadelphia, Pa., Feb. 23, adults hibernating in Oak; V. A. E. Daecke. East Falls Church, Virginia, July 13, adults running over bark of felled oak tree at night; collected with light, H. B. Kirk.

Aulonium longum Lec.—These beetles transform from pupae to adults in *Dendroctonus* cells and beneath the bark of Yellow Pine, during the latter part of July, in Colorado. They hibernate in the adult stage, gathering in numbers in company with *Hypophloeus*, *Nemosoma*, Histerids, Staphylinidae etc., beneath the bark of pine trees abandoned by *Dendroctonus* the previous year. After an infestation by *Dendroctonus*, a tree is a store house of interesting insect life, consisting of myriads of secondary insects and predaceous species.

Aulonium tuberculatum Lec.—Mt. Alto, Pa., May 19, under bark of cut pines infested with *Ips* and other bark beetles; Chambersburg, Pa., April and June adults beneath pine bark.

Colydium lincola Say.—Harrisburg, Pa., adults active at night on Scolytid infested hickory trees, running over outer bark and in and out of borer galleries and Scolytid mines. Adults occur in pin hole galleries in coniferous trees in Colorado.

MELANDRYIDAE

Mystaxus simulator Newm.—Adults were reared in May and June from dead *Viburnum dentatum* and ninebark (*Opulaster opulifolius*) collected at Chambersburg, Pa.

BOSTRICHIDAE

Xylobiops basillare Say.—Adults were reared from dead poison ivy (*Rhus toxicodendron*) collected at Hummelstown, Pa.

CURCULIONIDAE

Eusphyrus walshi Lec.—Hummelstown, Pa., reared from dead stems of poison ivy, (*Rhus toxicodendron*).

Apion umboniferum Fall—(Det H. C. Fall) Millvill, Pa., October. Specimens emerged from dried fruit of *Viburnum prunifolium* in seed herbarium; Salome Comstock Miller.

Prof. H. C. Fall states with identification, "This has been one of the rare species and I have not been fortunate to obtain any since my *Apion* paper was published. At that time only three specimens were known to me. It is probably in collections mixed with *A. herculanum* or *A. parvulum*."

Hormorus undulatus Uhler.—In addition to eating the leaves of lily of the valley and Solomon's seal we have found the adults feeding on leaves of *Uvularia perfoliata*.

Otidoccephalus chevrolatii Horn—Inglenook, Pa., reared from dead alder.

Gymnetron sp.—Harrisburg, Pa., Sept. 26. At this time adults of a *Gymnetron* resembling *G. tetrum* Fab. were found on "Butter and Eggs" *Linaria vulgaris*. At the same time larvae were found in the new or green seed pods near the top of the plant, while in the older dry seed pods we found pupae and adults of this *Gymnetron*. The seed had been eaten by the larvae, which when full grown make a pupal cell at the base of the pod.

Cylindrocopturus longulus Lec.—Rockville, Pa., adults reared from trunk of small dying pine trees, two or three inches in diameter. The larvae work in the bark and sapwood.

Acoptus suturalis Lec.—Mechanicsburg, Pa., May 23rd, dead branches of black birch, (*Betula lenta*) found on the ground contained larvae, pupae and

adults of this species. Also reared from *Carpinus*. Probably breeds in various dead trees.

Ceutorhynchus puberulus Lec.—Rose Garden, York County, Pa.; investigating a reported occurrence of garlic mustard, *Alliaria officinalis*, Messrs. McCubbin, Gress, Guyton, and Champlain of the Penna. Bureau of Plant Industry visited the section on May 4th and found the plant growing profusely in the corner of a wood lot near an open field. This European plant was heretofore unknown in Pennsylvania except from the Philadelphia section. On the stems and foliage of the plant at this time were numerous small Curculionids pairing, running over the plants and feeding. Specimens were collected and proved to be *C. puberulus* Lec.

Acalles carinatus Lec.—Harrisburg, Pa., reared from dead standing beech, about two inches in diameter.

NEW CANADIAN EUCOSMINAE (LEPIDOPTERA)*.

BY J. H. MCDUNNOUGH,
Ottawa, Ont.

Eucosma watertonana n. sp.

Head, thorax and primaries light ochreous brown, the latter very similar in color and maculation to *galenapunctana* Kft., except that the sprinkling of silvery dots over the disk is absent and traces only of slight dark dots are visible. Apical half of costa with a number of short oblique cream-colored dashes, which become longer towards apex of wing and are in this portion more or less covered with silvery scaling; ocellar spot defined laterally by two vertical silvery bars, between which are generally traces, at least, of two black horizontal dashes. Basal half of fringes whitish, well sprinkled with black dots, outer half pale creamy. Hind wings light smoky with pale fringes. Beneath primaries smoky. Costa pale with numerous dark dashes in apical portion; hind wings as above. Expanse 19-22 mm.

Holotype—♂, Waterton Lakes, Alta., July 25, 1923, (J. McDunnough); No. 1396 in the Canadian National Collection, Ottawa.

Allotype—♀, same data.

Paratypes—7 ♂, 6 ♀, same data and also July 13, 19.

The male genitalia are quite similar to those of *serapicana* Heinr; but from this species it is easily separable by the ochreous brown color of primaries, those of *serapicana* being of a dull clayey-white. The specimen which served for the description of this latter species was evidently a rather immaculate one; a series in the Canadian National Collection from Lethbridge, Alta., shows considerable variation in this respect, some specimens having the disk quite heavily marked with small round dark spots as well as showing the pale oblique streaks on the apical portion of costa, characteristic of the group.

Sonia canadana n. sp.

Very similar to *constrictana* Zell. but deeper in color with the maculation less clearly defined. The outer edge of the dark basal patch of primaries is slightly further from base of wing than in *constrictana*, and is more distinctly angled in centre of wing; the dark patch above anal angle is much more broadly

*—Contribution from the Division of Systematic Entomology, Entomological Branch, Dept. of Agric., Ottawa.

triangular and in consequence the pale area between the basal and tornal patches is much narrower and shows a distinct outward bend, directed toward the apex of the wing; the smaller dark patch superimposed on the tornal patch is poorly defined and the entire costo-apical area, with the exception of the white streaks, is suffused with dark brown, which frequently also obscures the ocellar patch. Expanse 14-15 mm.

Holotype—♂, Aweme, Man., July 16, (N. Criddle); No. 1416 in the Canadian National Collection, Ottawa.

Allotype—♀, same data, but July 8.

Paratypes—4 ♂, Trenton, Ont., July 30, Aug. 11, 13, Sept. 4, (J. Evans).

The ♂ genitalia are essentially the same as those of *constrictana* as figured by Heinrich (Pl. 44, fig. 291).

***Gretchena semialba* n. sp.**

Head, thorax and primaries in general appearance rather dark smoky brown without any clearly defined maculation. The basal area of primaries is considerably peppered with white scaling and is poorly defined by a brown shade, forming a strong outward angle below cell. The outer half of wing is shaded with light brown and crossed in its costal portion by four oblique silvery (or in fresh specimens, purplish-silvery) bands, arising from geminate white costal spots; of these the first and third are connected with vertical silvery bars which partially outline the ocellar spot, the second is short and the fourth touches the outer margin slightly below apex, forming a minute white dash in the dark border line; the inner silvery band and vertical bar are bordered inwardly with dark scaling which forms an oblique indistinct postmedian band with an outward angle at the junction of the band and the ocellar bar. Fringes dusky, paler at the anal angle. Secondaries white with the outer margin broadly shaded with brown; fringes white with a dusky tinge in the apical half of wing. Beneath, primaries dusky with the four geminate white costal spots clearly visible, secondaries white with slight brown sprinkling along costal and outer margins. Expanse 10-12 mm.

Holotype—♂, Aweme, Man., May 28, 1924, (N. Criddle); No. 1395 in the Canadian National Collection, Ottawa.

Allotype—♀, Ottawa, Ont., May 14, 1921, (J. McDunnough).

Paratypes—1 ♂, Hymers, Ont., May 24-31, in Barnes Collection; 1 ♀, Ottawa, Ont., May 27, 1905, (C. H. Young), in the Canadian National Collection.

The white secondaries in both sexes render this species very distinct from any other species in the genus. The male genitalia are very similar to those of *amatana* Heinr.

STUDIES IN NORTH AMERICAN BORBORIDAE (DIPTERA)*.

BY ANTHONY SPULER,

Pullman, Wash.

(Continued from page 104).

Leptocera (*Halidayina*) *spinipennis* Haliday. (Fig. 3.)

Haliday: Ent. Mag. III. 331. (1836). (*Limosina*).

Duda: Abhand. Zool.-Botan Wien, X. I. 192 (1918). (*Limosina*).

sordipes Adams: Kan. Univ. Bull. II. 455 (1904). (*Limosina*).

Thirty-three specimens from the following localities:

WASHINGTON: Pullman, (Mann); Union Flat, Clarkston, Kamiac Butte, Bickleton and Lake Crescent (Melander). OREGON: Salem, Viento (Melander). IDAHO: Kendrick, Moscow, Potlatch, Lewiston, Collins (Melander). BRITISH COLUMBIA: Kaslo (Currie). CALIFORNIA: Mill Valley (Doane). SOUTH DAKOTA: Brookings (Aldrich, Univ. of Kan.). NEW HAMPSHIRE: Mt. Washington (U. S. N. M.). NEW JERSEY: Woodbury (Johnson).

Subgenus *Spelobia* n. subgen.

Eyes extremely small, bare; cheeks about as high as long diameter of eye; ocellar tubercle distinct; interfrontal bristles well developed; antennae divergent but not opposed; arista very long, four to six times antennal length; face concave, slightly carinate between antennae. Last section of third vein straight, ending near wing-tip; costa not produced beyond third vein. Apical bristle present. Dorsal surface of genital segment larger than ventral; anal cavity deflected downward. Type species.—*S. tenebrarum* Ald.

SPECIES OF SPELOBIA

1. Mesonotum with two pairs of dorsocentral bristles; arista very long, five to six times antennal length, with long pubescence; interfrontal bristles in three pairs, the middle pair cruciate, much longer than the other two *tenebrarum* Ald.
Mesonotum with a single pair of dorsocentral bristles; arista shorter, not more than four times antennal length, pubescence shorter; cheeks higher than eye; discal cell long; subshining piceous species; pleura reddish. (Fig. 6) *lucifuga* n. sp.

Leptocera (Spelobia) tenebrarum Aldrich (Fig. 7).

Aldrich: 21 Ann. Rpt. Geol. Ind. XXI, (1896) (*Limosina*).

Bezzi: Rivista Ital. Speleologia. I. (1903). (*Limosina*).

Banta: Carnegie Inst. Publ. 67. 45 (1907) (*Limosina*).

stygia: Coquillett; Am. Nat. XXXI 384 (1897). (*Limosina*).

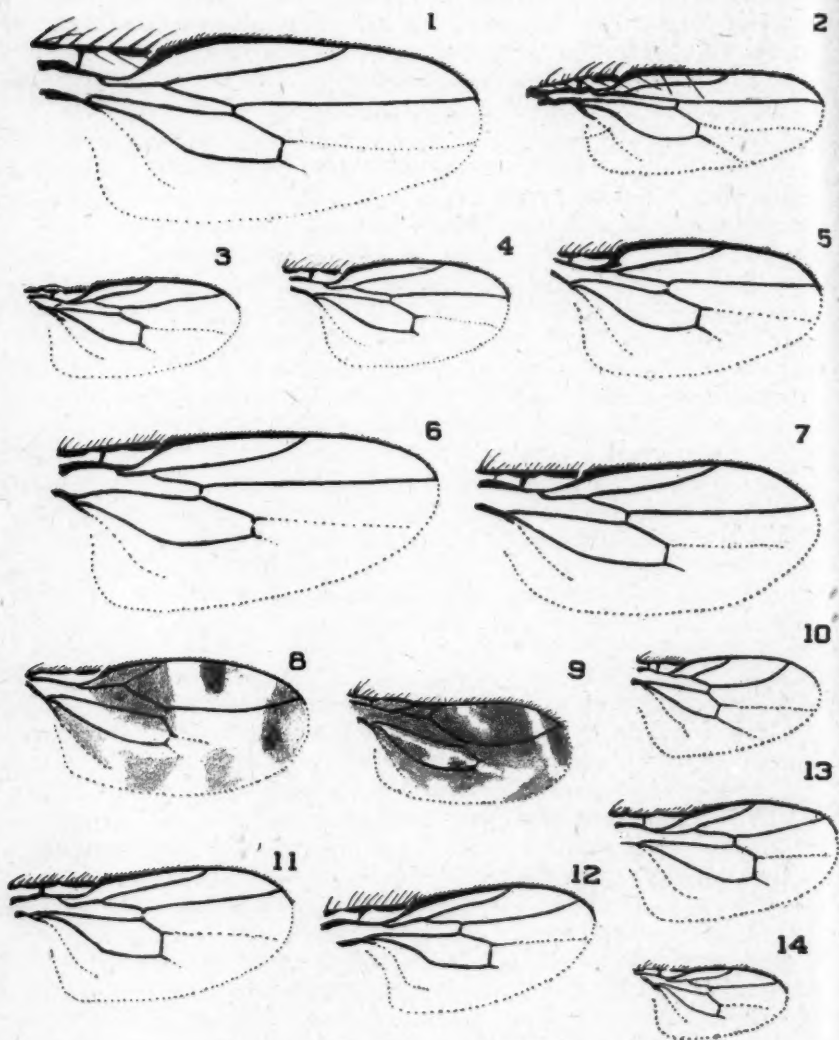
A peculiar species with very small eyes and extremely long arista.

Six specimens, four from Wyandotte Cave, Ind. (Aldrich) and two cotypes from the Mammoth Cave in Kentucky. (Aldrich).

Bezzi reports this species occurring in Grotta di Cacahua Milpa, Mexico.

***Leptocera (Spelobia) lucifuga* n. sp. (Fig. 6).**

Subshining piceous. Front twice as broad as deep; setigerous stripes and frontal triangle to near frontal lunule slightly silvery pollinose; the divergent stripes and lower front ferruginous, the stripes changing to black toward vertex; bristles well developed; lower fronto-orbital bristle three-fourths as long as upper, orbital setulae minute, not extending above the fronto-orbital bristle; interfrontal bristles in three pairs, the anterior two pairs cruciate, the middle pair longer than the others; interfrontal setulae in two pairs, at right angles to interfrontal rows; face and cheeks gray pollinose; face with piceous markings on each side of carina and along anterior margin, deeply concave in profile; clypeus broadly visible from in front; cheek at vibrissal angle slightly higher than eye; bucca with an anterior bristle and five irregularly arranged setulae; oral setulae hairlike; eyes very small, occupying less than half the height of head from vertex to vibrissal angle; antennae divergent; arista about four times antennal length, pubescence moderately short. Mesonotum with a central stripe and lateral margins fuscous; dorsocentral bristles in one pair; acrostichal setu-



NORTH AMERICAN BORBORIDAE.

Fig. 1. *Thoracochaeta seticosta* n. sp. Fig. 2. *Thoracochaeta johnsoni* n. sp. Fig. 3. *Halidayina spinipennis* Hal. Fig. 4. *Thoracochaeta brachystoma* Stenh. Fig. 5. *Thoracochaeta rufa* n. sp. Fig. 6. *Spelobia lucifuga* n. sp. Fig. 7. *Spelobia tenebrarum* Ald. Fig. 8. *Pterogramma madaris* n. sp. Fig. 9. *Pterogramma luxor* n. sp. Fig. 10. *Trachypella lineafrons* n. sp. Fig. 11. *Coprophila vagans* Hal. Fig. 12. *Coprophila ferruginata* Stenh. Fig. 13. *Coprophila mitchelli* Mall. Fig. 14. *Coprophila exiguella* nov. nom.

lae numerous, arranged in eight rows between the dorsocentral bristles; post-humeral bristles absent; scutellum triangular, opaque, disc bare; marginal bristles four, the anterior pair two thirds as long as the posterior; pleura piceous, with sutures yellow, sternopleura with a posterior bristle and two anterior setae. Legs piceous, with coxae, trochanters, knees, apices of tibiae and tarsi yellow; middle femora with a single anterior preapical seta; middle tibiae with five extensor, two on basal third and three on apical third, and two flexor bristles, one a little beyond middle and one at apex; hind metatarsi a little thickened, two-thirds as long as second joint. Wings rather long and narrow; veins pale brown; costa ending at third vein; first section short ciliate, second slightly longer than third; basal section of third vein three-fourths as long as distance between crossveins and one-third as long as last section of second vein; discal cell long and narrow, short appendiculate; outer crossvein but little more than one-third as long as distance between crossveins; third vein straight on last section ending near wing-tip; fourth vein traceable to wing-margin. Abdomen short, cylindrical; second segment nearly twice as long as third. Halteres yellow. Length: 1.5 mm.

Holotype.—Male; Corvallis, Oregon, May 26, 1896, No. 332.

Subgenus **Elachiosoma** Rondani.

Rondani: Coprom. 16. VII. (1880).

Duda: Abhand. Zool-Botan. Ges. Wien. X. I. 33 (1918).

Ocellar triangle raised, ocellar tubercle small; interfrontal bristles weak; eyes small, bare; antennae directed outward; face produced above, broadly carinate, slightly retreating in profile; front very broad; central strip broad, shining, lateral stripes narrow, opaque, inner and outer margins each with a row of hairs. Costa extending much beyond third vein and ending near wing tip; last section of third vein strongly curved up, outer and inner crossveins very close together. Mesonotum without macrochaetae; bristles of legs reduced; apical bristle present. Genital segments in male short and devoid of long hairs. Type species.—*E. nigerrima* Hal.

Leptocera (Elachiosoma) approximata Malloch.

Malloch: Proc. Ent. Soc. Wash. XV. 3 (1913). (*Limosina*).

Described from Texas.

Subgenus **Bromeloecia** n. subgen.

Eyes large, bare; front raised in center; interfrontal bristles well developed; ocellar tubercle present, ocelli distinct; antennae directed outward; face distinctly excavated beneath tubercle. Mesonotum with not more than two pairs of dorsocentral bristles. Wings with veins concentrated toward base of wing; crossveins very close together; last section of third vein abruptly bent up; costa short, not extending beyond third vein and ending much before wing-tip, first section short hairy. Type species.—*B. bromeliarum* Knab & Malloch.

Leptocera (Bromeloecia) bromeliarum Knab & Malloch.

Knab & Malloch: Ent. News, 414 (1912). (*Limosina*).

Described from Mexico.

Subgenus **Thoracochaeta** Duda.

Duda: Abhand. Zool-Botan. Ges. Wien. X. I. 32 (1918).

Eyes rather small, occupying but little more than half the height of head from vibrissal angle to vertex; facets large; ocellar tubercle indistinct, ocelli small;

antennae directed outward, widely separated, distance between antennae equal to antennal length or nearly so; face vertically sinuose, tuberculate between antennae. Wings with first section of costa bristly, costa produced but little beyond third vein; last section of third vein straight or slightly curved down at apex, never curved up. Hind tibiae with long hair-like bristles on extensor surface; apical bristle present; middle metatarsi with a double row of short, stiff setae beneath. Mesonotum with four pairs of stiff upwardly projecting, dorsocentral bristles, the anterior pair distinctly convergent. Genital segments in male short, the ventral surface only with long hairs; ventral and dorsal surfaces equal. Type species by present designation.—*T. zostorae* Hal.

SPECIES OF THORACOCIAETA DUDA.

1. Second section of costa longer than third, first section with long incurved bristles; eyes rather large, occupying considerably more than half height of head from vibrissal angle to vertex; legs distinctly bristly; middle tibiae with numerous, strong bristles on extensor surface; extensor surface of hind tibiae with two long bristles in addition to numerous short hairs; hind metatarsi and following joint thickened. Fig. 1 *seticosta* n. sp.
Second and third sections of costa equal or nearly so; hind tibiae without distinct bristles 2.
2. Second section of costa in female with long incurved bristles; wings long and narrow, broader in male; basal section of third vein almost two times second section of fourth; fifth vein extending to near wing margin; dorsocentral bristles distinct; hind tibiae with numerous rather long hairs but without distinct bristles; halteres fuscous with yellow stem. Fig. 2
..... *johnsoni* n. sp.
Second section of costa in female devoid of long incurved bristles; wings shorter; dorsocentral bristles less distinct 2.
3. Entirely ferruginous species, even the bristles reddish; wings opalescent, second and third sections of costa equal, last section of third vein straight; acrostichal setulae numerous, arranged in eight rows between the dorsocentral bristles; interfrontal bristles in three pairs; hind tibia without distinct bristles; hind metatarsi two-thirds as long as second joint. Fig. 5
..... *rufa* n. sp.
Brownish to blackish species; wings darker; second section of costa slightly longer than third; last section of third vein curved down at apex; hind metatarsi slightly shorter than second joint; interfrontal bristles in four pairs; halteres fuscous. Fig. 4 *brachystoma* Stenh.

Leptocera (Thoracochaeta) seticosta n. sp. (Fig. 1).

Lightly cinereous, opaque black. Front twice as broad as deep slightly browned, with the divergent stripes, divided by the broad interfrontal stripes, black; lower front raised at center; ocelli distinct, not widely separated; ocellar tubercle slightly developed, with numerous diverging setae; bristles of head rather strong; lower fronto-orbital bristle three-fourths as long as upper; orbital setulae quite distinct; interfrontal rows widely separated with bristles in four pairs, uniform in size, interfrontal setulae in two pairs, located on lower margin of front; face broadly carinate, shallowly yet distinctly concave in profile; car-

ina between the antennae well developed; clypeus broadly visible from in front; antennae directed outward; arista two times antennal length with long sparse pubescence; cheeks, at narrowest point, two-fifths as high as eye; buccae with three setae, the anterior one long and bristle-like, and a number of minute setulae; oral setulae rather long, six in number; eyes rather large, occupying at least two-thirds of the head from vertex to oral margin. Mesonotum flattened posteriorly, reddish on lateral margins; dorsocentral bristles widely separated, in three pairs, the posterior pair longer than the other two; acrostichal setulae short, arranged in ten rows between the anterior pair and six between the posterior pair; middle acrostichals long and bristle-like; scutellum triangular; disc flat and bare; marginal bristles four; pleura piceous with suture reddish; upper sternopleura with a strong posterior bristle and anterior setae. Legs with front coxae slightly gray dusted; middle and hind coxae and trochanters pale brown, knees, apices of tibiae and tarsi dark fuscous; front femora with three rather long, preapical hair-like bristles; middle femora with a complete row of short and three longer setae near apex on anterior side and a bristle-like seta on posterior side; middle tibiae with three pairs of extensor bristles, increasing in size apically and arranged as follows: a pair on basal fourth, a pair at middle and a pair at apical third, and one flexor bristle at apex; hind tibiae with two rather long bristles, on extensor surface, one at basal third and one at apical third; first and second joint of hind tarsi slightly thickened; hind metatarsi two-thirds as long as second joint. Wings infumated, rather long and tapering apically; veins brown; costa produced slightly beyond third vein, first section bristly, shorter than third, third section three-fourths as long as second; penultimate sections of third and fourth veins equal or nearly so, two-fifths as long as basal section of second vein and two times outer crossvein; last section of third vein straight, ending near wing-tip; fourth vein traceable to wing-margin; fifth vein produced half way to wing-margin on its last section. Abdomen shining black; dorsum broad and flat; segments equal. Halteres black with yellow stem. Length 2.5 mm.

Holotype.—Female; Seattle, Wash. Aug. 2, 1908 (Melandar).

***Leptocera (Thorocochaeta) johnsoni* n. sp. (Fig. 2).**

Blackish, lightly cinerous, opaque, head transverse; front nearly twice as broad as deep; bristles moderately strong; fronto-orbital bristles divergent, nearly uniform in size; interfrontal bristles in three pairs, widely separated; ocellar tubercle absent; ocelli widely separated and rudimentary; face very little concave in profile, almost flat near the antennae; clypeus broadly visible from in front; cheeks, nearly half as high as eye; bucca with an anterior bristle and two posterior setae; oral setae increasing in size anteriorly; eyes small, occupying but little more than half the height of head from oral-margin to vertex, facets large and distinct; antennae large, strongly diverging, separated a distance nearly equalling the width of the eye, second joint infusate, swollen on its inner face, almost sharply margined at the end; arista two times antennal length, its pubescence short. Mesonotum somewhat flattened, dorsocentral bristles in three pairs; acrostichal setulae numerous, arranged in ten irregular rows between the anterior and in six between the posterior pairs of dorsocentral bristles; scutellum blunt; disc bare; marginal bristles four. Legs fuscous; middle femora with three

anterior preapical bristles; middle tibiae with one flexor and eight extensor bristles, a short and a long pair on basal half and a short and long pair on apical third; hind tibiae without machrochaetae; hind metatarsi but little thickened, three-fourths as long as the second joint. Wings cinereous, opaque, broad in male, narrow in female; costa blackish, other veins brown; first section of costa with four long and two shorter incurved bristles; second section, in female only, with three long incurved bristles, equal to third; third vein straight or slightly bent down near apex, ending almost at wing-tip; basal section of third vein nearly two times as long as the distance between crossveins; last section of fifth vein extending to near wing-margin. Abdomen flat, oval in female, cylindrical in male. Halteres with yellow stem and fuscous knob. Length: 1.5 mm.

Type.—Female: Seattle, Wash. (Melander).

Paratypes.—Forty-nine specimens from the following localities: WASHINGTON: Seattle, Colby, Crescent Bay (Melander).

This peculiar species was collected on seaweed.

***Leptocera (Thoracochaeta) rufa* n. sp. (Fig. 5).**

Entirely ferruginous species. Front distinctly broader than long; bristles short and stiff; interfrontal bristles in three pairs, the two diverging rows widely separated; ocellar triangle indistinct; ocelli widely separated and rather small; eyes small, but little more than half the height of head from vertex to vibrissal angle; antennae widely divergent; arista a little more than two times antennal length, with long, loose pubescence; face broadly tuberculate, not concave in profile; clypeus broadly visible from in front; cheeks one-half as high as eye. Mesonotum convex, with three pairs of short stiff dorsocentral bristles arranged in widely divergent rows between the anterior pair of dorsocentral bristles, scutellum triangular, with four marginal bristles. Legs moderately long; middle femora with numerous rather stiff setae on anterior surface; middle tibiae with three pairs of extensor bristles, the middle pair weaker than the others; first joint of middle tarsi with numerous stiff setulae beneath; hind metatarsi two-thirds as long as the next joint. Wings somewhat opalescent; costa ferruginous, other veins pale yellow; costa extending beyond third vein and setulose for its entire length, first section bristly, a little shorter than second, second and third subequal; second section in female without long incurved bristles; basal section of third vein slightly longer than second section of fourth; outer crossvein two thirds as long as distance between crossveins. Length: 1 mm.

Type.—Male; Horseneck Beach, Mass. (Hough).

Paratypes.—Eight specimens from Woods Hole, Mass. (Hough); Florida and Rhode Island (U. S. N. M.).

Leptocera (Thoracochaeta) brachystoma Stenhammar (Fig. 4).

Stenhammar: Coprom. Scand. 393 (135) (1855). (*Limosina*).

Duda: Abhand. Zool-Botan. Ges. Wien. X. I. 100 (1918). (*Limosina*).

andalusiaca Strobl: Wien. Ent. Zeitg. XIX. 69 (1900). (*Limosina*).

Four specimens from Cold Spring Harbor, New York; collected by A. L. Melander.

Subgenus *Coprophila* Duda.

Duda: Abhand. Zool-Botan. Ges. Wien. X. I. 45 (1918).

Eyes large, bare; antennae divergent but not opposed; arista moderately short, with short pubescence. Mesonotum with numerous, acrostichal setulae,

acrostichal bristles absent; dorsocentral bristles reduced. Costa produced beyond third vein; first section with short setae except in *ferruginata* Fallen where it is bristly. Scutellum with disc uniformly setulose, never with bristles. Preapical and apical bristles always absent; middle metatarsi with numerous distinct bristles beneath. Type species by present designation.—*C. vagans* Hal.

SPECIES OF COPROPHILA DUDA.

1. Second section of costa distinctly longer than third 2.
Second section of costa shorter than third or but slightly longer 3.
2. Last section of third vein distinctly curved up; first section of costa with strong bristles; middle metatarsi with a distinct bristle at base; almost entirely ferruginous species. Fig. 12 *ferruginata* Stenh.
Last section of third vein straight or but slightly curved up; bristles on first costal section weaker; penultimate sections of third and fourth veins equal and slightly longer than outer crossvein; middle metatarsi with basal bristle less distinct. Fig. 11 *vagans* Hal.
3. Second section of costa decidedly shorter than third; costa black, other veins pale; interfrontal bristles in four pairs; halteres yellow, sometimes infuscate. Fig. 14 *exiguella* nom. nov.
Second and third sections of costa equal or nearly so. First costal division two-thirds as long as second; outer crossvein at slightly more than its own length from inner; costa extending well beyond third vein; third joint of antennae, face, and cheeks more or less distinctly reddish brown; dorsocentral bristles in one pair. Fig. 13 *mittelli* Mall.

Leptocera (Coprophila) ferruginata Stenhammar (Fig. 12).

Stenhammar: Copr. Sc. 397, (193) 22 (1855). (*Limosina*).

Duda: Abhand. Zool-Botan. Ges. Wien. X. I. 215 (1918). (*Limosina*).

This species is very widely distributed both in North America and in Europe. One hundred and fifty specimens from the following localities:

WASHINGTON: Pullman, Deer Park and Almota (Melander). IDAHO: Kendrick and Bovill (Melander). BRITISH COLUMBIA: Nelson (Melander); Kaslo, South Fork (Currie). OHIO: Medina (Hines). IOWA: Ames (Aldrich). KANSAS: Lawrence (Aldrich). SOUTH DAKOTA: Brookings (Aldrich). ILLINOIS: Algonquin (Nason). PENNSYLVANIA: Swarthmore (Cresson); Chester Co. (Bradley); Lansdowne (Johnson).

Leptocera (Coprophila) vagans Haliday (Fig. 11).

Haliday: Ent. Mag. I. 178 (1833). (*Limosina*).

Duda: Abhand. Zool-Botan. Ges. Wien. X. I. 210 (1918). (*Limosina*).

Numerous species from the following localities:

WASHINGTON: Seattle, Spokane, Yakima and Kennewick (Melander). CALIFORNIA: Alameda (Cresson). D. C., Washington (U. S. N. M.).

Leptocera (Coprophila) exiguella nov. nom. (fig. 14).

exigua Adams, Kansas Univ. Bull. II. 454 (1904). (*Limosina*).

Front opaque black, with median line shining; occiput black, shining; face cheeks and mouthparts dull, light colored; antennae black; arista pubescent. Thorax black, shining; pleura with a brownish cast. Halteres white. Abdomen black, shining; venter brownish. Wings hyaline; third section of costa longer than second, first section with a few long bristly hairs; last section of second vein longer than the first section of third, joining the costa nearly oppos-

ite the apex of discal cell; distal portion of third vein nearly straight, ending slightly before the apex of the wing. Length 0.8-0.9 mm. (Adams). Las Cruzas, New Mexico.

In addition to the foregoing description of Dr. Adams, the following notes made from two of the type specimens loaned by the University of Kansas will be of service in identifying this species.

Four pairs of interfrontal bristles; the ocellar bristles distant from each other a little more than the width of an ocellus; the lower fronto-orbits setulose; arista two and one-half times antennal length, its pubescence short; face concave in profile; cheeks with two rows of setulae. Disc of mesonotum and of the scutellum uniformly setulose, without macrochaetae except a transverse row of six bristles immediately in front the scutellum; scutellar margin with four long bristles.

L. (Coprophila) exigua Adams is preoccupied by *L. (Scotophilella) exigua* Rondani (Coprom. Bull. Soc. Ent. Ital. XII. 24.6, 1880). The writer proposes the name *exiguella* for Adams' species.

Fifty-nine specimens from the following localities:

WASHINGTON: Pullman and Union Flat (Melander). IDAHO: Potlatch and Coeur d'Alene (Melander). ARIZONA: Tucson (U. S. N. M.). ILLINOIS (Ill. Univ.). MASSACHUSETTS: Forest Hills (Melander). PENNSYLVANIA: Jack Run, Chester Co. (Cresson). FLORIDA: Keene (Coquillett). BERMUDA ISL. (Kincaid).

Leptocera (Coprophila) mitchelli Malloch (Fig 13).

Malloch: Proc. Ent. Soc. Wash. 15. 135 (1913). (*Limosina*). Texas.

Four specimens from Tucson, Ariz. (Hubbard).

NEW CANADIAN MICROLEPIDOPTERA.

BY ANNETTE F. BRAUN,

Cincinnati, Ohio

GELECHIIDAE

Aristotelia devexella n. sp.

Head bright brown, reddish tinged, face darker with some white scales; palpi gray brown, second segment with three white rings, the third ring at apex the narrowest, third segment with a spot at base, a second spot at middle and a line along lower edge white. Thorax dark reddish brown, patagia light brown. Fore wings rather dark brown, area below fold usually paler; an oblique gradually broadening ochereous brown patch lies along the middle of the wing from the first white fascia to the third; this color also covers the whole apical part of the wing beyond the third fascia. The wedge-shaped bar preceding the oblique slightly dusted white fascia at one-fourth is darker than the ground color, especially near the fold, as is also the half-crescent costal mark before the second fascia. The second white fascia is broad on costa and, except on its edges, is usually more or less filled in with dusting above the concavity of the dark half-crescent; it is angulated on the middle of the wing, where it is usually broken by the black discal streak; this streak is sometimes reduced to two black dots, one on each side of the fascia; the plical black streak also interrupts the fascia. At three-fourths, a narrow inwardly oblique wedge-shaped white fascia, broadest on costa, is evenly attenuated toward dorsum, sometimes running out to a point

before reaching the margin; the second black discal streak interrupts it. These white marks, especially the third fascia, are often rosy-tinged. Extreme margin around apex edged with dark brown scales, alternating with groups of white or rosy-tinged scales, from which whitish or pinkish tufts extend into the gray cilia. Hind wings gray, with a decided iridescent pinkish luster. Legs dark brown, with some white dusting; tips of segments and transverse bars white. Abdomen dark brown, posterior margins of segments, especially on the underside, silvery. Expanse: 16-17 mm.

Type—♂, Waterton Lakes, Alta., July 13, (J. McDunnough); No. 1331 in the Canadian National Collection, Ottawa.

Allotype—♀, Waterton Lakes, Alta., July 26, (J. McDunnough).

Paratypes—2 ♂, Waterton Lakes, Alta., July 25, 26, (J. McDunnough).

This species is distinguished by the oblique fascia at three-fourths, which replaces the opposite costal and dorsal spots of allied species; it is also much larger than any of the closely allied species.

***Gelechia petulans* n. sp.**

Palpi very long, slender, second segment scarcely thickened, third segment longer than the second; brownish black, the base whitish; white dusting on the second segment and a few white scales on the third segment. Antennae blackish brown. Head brownish black, with a few paler scales and an occasional white scale. Fore wings pointed, brownish black, marked with whitish irroration, which forms more or less distinct patches and fasciae, but is sometimes almost entirely absent; plical and discal spots black. An oblique patch of scattered white scales from basal fourth of costa is often distinct only on the fold and is occasionally only indicated by a few scattered white scales; ground color just preceding this deepening to black especially on the fold. First discal spot above the plical; the two usually confluent. Across the middle of the wing, scattered white scales, usually densest on the fold, faintly indicate a second broad fascia. At apical fourth an oblique inwardly curved fascia of white irroration; this is the most distinct whitish marking and even it is sometimes nearly obsolete. A patch of whitish scales before the apex in the costal cilia; scattered white scales form a more or less distinct line along the termen. Hind wings gray-brown, somewhat bronzy. Legs brownish black, with whitish dusting, white-tipped tarsi, and white-barred hind tibiae. Expanse: 15-17 mm.

Type—♂, Moraine Lake, Alta., August 6, (J. McDunnough); No. 1332 in the Canadian National Collection, Ottawa.

Paratypes—6 ♂, Moraine Lake, Alta., August 4, 6, 7, (J. McDunnough).

This species is allied to *G. alternatella* Kearf., with which it agrees in palpal structure and wing shape, and general position of markings. The clearly defined markings of that species are here however merely indicated by scattered whitish irroration.

***Gelechia nigrobarbata* n. sp.**

Brush of the second segment of the palpi very long, black, rarely with a few whitish scales; palpi otherwise blackish, spotted with white, the white predominating on the inner side of the second segment and on both upper and inner sides of the third segment. Antennae blackish brown. Head and thorax dark

brownish black with some gray and browner mottling. Fore wings paler than the thorax, finely irrorate, clothed with intermixed dark gray-tipped pale fuscous scales and brownish ochereous scales some of which are darker-tipped. The general wing color varies from dark blackish brown to a more distinctly ochereous brown depending on the proportion of brownish ochereous scales. First discal spot usually absent, second discal indistinct, sometimes also wanting. Cilia pale brownish gray, with a line of darker scales through their middle along termen. Hind wings gray with purplish iridescence. Legs blackish fuscous, with scattered white dusting, tips of segments faintly paler. Expanse: 14-15 mm.

Type—♂, Waterton Lakes, Alta., June 26, (J. McDunnough); No. 1333 in the Canadian National Collection, Ottawa.

Paratypes—11 ♂, Waterton Lakes, Alta., June 20, 24, 26, (J. McDunnough).

The distinguishing characteristics of this species are the conspicuous black brush of the labial palpi, the mixture of two colors of scales, and absence of pale transverse markings.

A number of worn specimens were collected by the writer in Glacier National Park, Montana, in July.

Gelechia oclusa n. sp.

Head pale fuscous, sometimes mottled with darker fuscous, palpi pale fuscous, dotted with darker scales, the brush and inner side of third segment paler, grayish straw-colored. Fore wings pale fuscous, the ground color obscured by close fine dusting formed by the dark fuscous tips of the scales. First discal spot usually obsolete, placed a little behind the plical spot; second discal usually present, sometimes quite distinct, but often little differentiated from the ground color. A pale grayish straw colored fascia at apical third, a little bent out in the middle of the wing, often more or less dusted with fuscous and obsolescent except on extreme costa; rarely absent. Cilia whitish fuscous, with scattered fuscous scales and a more or less distinct line through their middle along termen. Hind wings pale brownish fuscous. Legs pale fuscous, dusted with darker fuscous, tips of segments and a median band on hind tibiae faintly paler. Expanse: 14-15 mm.

Type—♂, Waterton Lakes, Alta., June 28 (J. McDunnough); No. 1334 in the Canadian National Collection, Ottawa.

Paratypes—17 ♂, Waterton Lakes, Alta., June 19 to June 28; July 9, 13, (J. McDunnough).

An obscure species, but apparently very common.

Gelechia permacta n. sp.

Palpi pale whitish fuscous, dusted with darker fuscous, except the lower and inner side of the brush and extreme tip of second segment. Face very pale fuscous, head darker. Fore wings very pale fuscous, densely and evenly dusted with dark fuscous, each scale pale at the base shading to dark fuscous. The elongate blackish plical spot is indistinctly connected with base by a single line of blackish scales along the fold; first discal spot about opposite the end of the elongate plical streak, very obscure; second discal larger, usually distinct. A faint whitish spot on extreme costa at three-fourths. Cilia pale fuscous dotted

with darker fuscous scales. Hind wings pale fuscous. Legs fuscous dusted, with tips of segments paler. Expanse: 20-21 mm.

Type—♂, Moraine Lake, Alta., August 6, (J. McDunnough); No. 1335 in the Canadian National Collection, Ottawa.

Paratypes—6 ♂, Moraine Lake, Alta., August 6, 7, (J. McDunnough).

Very similar in general character to *G. occlusa*, but distinguished by its much larger size and absence of pale fascia.

INCURVARIIDAE

***Lampronia sublustris* n. sp.**

Palpi yellowish white; antennae dark gray, clothed with whitish scales in the basal third. Head pale straw yellow or whitish; thorax pale straw yellow; fore wings pale straw yellow, scarcely or not at all shining, cilia at their bases a little darker than the ground color of the wing, whitish toward tips. Hind wings grayish, scarcely darker than the fore wings, cilia yellowish white. Legs whitish, fore and middle pair shaded with fuscous. Expanse: 17 mm.

Type—♂, Waterton Lakes, Alta., June 26, (J. McDunnough); No. 1336 in the Canadian National Collection, Ottawa.

Paratypes—1 ♂, 1 ♀, Waterton Lakes, Alta., June 20, (J. McDunnough), in the Canadian National Collection, Ottawa; 1 ♀, Logan Canyon, Cache County, Utah, June 11, (Annette F. Braun), taken on a north slope beneath Douglas fir (altitude 6800 feet).

Nearest to *L. politella* Walsingham, but with broader wings and lacking the luster of that species. Veins 7 and 8 (R_4 and R_5) of the fore wing are long-stalked, thus distinguishing this species from *L. aenescens*, in which these veins are separate or short-stalked, and from *L. politella*, in which these veins are usually separate.

A NEW CICINDELA FROM THE ADJACENT TERRITORY OF
MONTANA AND ALBERTA

BY NORMAN CRIDDLE,

Aweme, Man.

Tiger beetles have been widely collected in North America, probably more so than any other family of Coleoptera. They have also been named to such an extent by systematists that it is frequently difficult to place the name correctly without resort to a locality label. One hesitates, under such circumstances, to describe other races, but as some one is sure to do so sooner or later, I have made this an excuse for giving a name to an insect that has been represented in the National Collection at Ottawa for some years and of which a small series was collected in 1924.

***Cicindela formosa fletcheri* new race.**

Above red (purple lake); beneath, including clypeus, checks and sides of prothorax violet. Head coarsely granulate, strigate between and beneath the eyes; labrum white, margined with black anteriorly, with three prominent teeth; thorax quadrate, slightly broader than long, granulate above; elytra sparingly punctate and finely aulaceous; the reflexed hind margins feebly serrate. The markings consist of a humeral lunule forming a tooth-like projection at basal third, a middle band obtusely bent and moderately deflexed, generally upturned or hooked at extremity, and an apical lunule, all being united by a rather broad white

margin; front, cheeks, sides of thorax and legs clothed with white hairs.

Length 15-18 mm.

This race differs from typical *formosa* Say in its larger size and average broader and more deflexed markings, in which it approaches *manitoba* Leng. It may be considered as a northern race of the former and a link between it and the latter, differing from *manitoba* in the narrower markings and more brilliant coloration.

Holotype—Male, Marias River, Sunshine Road, Montana, September 5, 1924 (Criddle).

Allotype—Female, same place and date.

Paratypes—Two males and five females from the same locality, one female from Ft. McLeod, Alberta, and one from Medicine Hat, Alberta, 1898, collected by the late Dr. James Fletcher, after whom the insect is named and to whose memory I am pleased to contribute this mark of esteem. Types and paratypes No. 1418 in the Canadian National Collection, Ottawa.

Fletcheri was taken on the south slope of a sandy hill where the vegetation was sparse and a few small bare spots occurred. It was already commencing to dig into the soil for hibernation purposes and one example was taken at a depth of approximately three feet below the surface. Larval burrows were fairly numerous and they had a similar cup-like pit, from which the hole entered horizontally, to those constructed by *manitoba*.

NOTE ON THE REARING OF EUROSTA SOLIDAGINIS AND VARIETY FASCIPENNIS. (TRYPANEIDAE, DIPT.).*

BY C. H. CURRAN,
Ottawa, Ont.

During the winter 1923-24 a number of galls on *Solidago* were received from Mr. K. M. King, Entomologist in charge of the Dominion Entomological Laboratory, Saskatoon. These galls were found, upon the emergence of the adults, to have been caused by *E. solidaginis fascipennis* Curran (Ent. News, XXXIV, 302). Of the sixteen specimens reared, not a single one showed any variation from the type, which is supposedly from Ottawa. It seems likely that the type should bear a label from one of the prairie provinces as it is most reasonable to suppose that it was reared in Ottawa from western material and not labelled with complete data as no other eastern specimens have been noted. It is probable that *fascipennis* represents a distinct species as it evidently is found in one or more of the prairie species of *Solidago* while *E. solidaginis* Fitch occurs in *Solidago canadensis* a species found near woods.

During the past winter Mr. E. Criddle, of Aweme, Manitoba, forwarded a number of galls from which it was hoped to secure further specimens of the variety *fascipennis*. All the specimens so far emerged (five) are typical *solidaginis* and agree perfectly with all the eastern specimens. Mr. Norman Criddle informs me that these galls probably all came from *Solidago canadensis* as this is the most abundant species in the vicinity of Aweme, which is situated near the edge of the prairie region but still in the wooded area.

*—Contribution from the Division of Systematic Entomology, Entomological Branch, Dept. of Agric., Ottawa.

These facts would indicate that further observations of the forms of *Eurosta* infesting *Solidago*, with special reference to the host species may bring to light data of considerable value in regard to the selective habits of the various forms and may prove that the two varieties described in "Entomological News" are worthy of specific rank.

BOOK NOTICES.

Fauna of New England—List of the Diptera or Two-winged Flies, by Charles W. Johnson, (Occasional Papers of the Boston Society of Natural History, VII).

For many years there has been an ever increasing demand for a list or catalogue of North American Diptera which would serve as supplementary to the Aldrich "Catalogue" and while the Johnson "List" does not fully supply the demand, dealing as it does with the fauna of only a small region it goes a long way in this direction. If one were to consider the "List" merely from the standpoint of the local Dipterous fauna, it might well be taken as a standard, but the general interest in it must of necessity come from a wider consideration and its value will be recognized by Dipterists in every part of North America. The author records 3,304 species divided among 69 families (of these the Phoridae, Megaprosopidae and Dexiidae are not truly separable from the Tachinidae). The introduction deals with the characteristics of the chief collecting ground in the various states and gives an excellent idea of the region. In the list itself, the arrangement of the families, genera and species, the student will find much of interest and more of value. The application of the most recently accepted nomenclature will prove of the utmost value to everyone, who, of necessity, must discuss species of economic or aesthetic consideration and the references to previously used names will leave little to be desired from the nomenclatural standpoint. The arrangement of the Syrphidae would have been more natural had Shannon's 'Revision' been followed, rather than that of Williston. In the Tachinidae the names proposed by Townsend are used and the "List" should be of the greatest value in indicating the relationships of the genera and species. There are, of course, a few obvious errors, but on the whole the list is very free from them and would have been more so, but for the illness of the author during the final proof-reading. A most pleasing feature is the bibliography occupying twenty-six pages. Here will be found a list of titles including all publications dealing with Diptera from Northeastern America from 1904 to the present time. While the bibliography is not complete for North America, it includes many important papers dealing with Diptera from the whole Nearctic region and should form the basis for a complete bibliography. Mr. Johnson is to be heartily congratulated upon the "List" which represents very largely the results of his efforts in collecting insects and data over a great many years. C. H. Curran.

A General Textbook of Entomology;—By A. D. Imms, M.A., D. Sc., Rothamsted Experiment Station, Harpenden, England, published by Methuen & Co. Ltd., London, price 36/-.

In this work the author presents some of the more important facts concerning the structure, physiology, development, and classification of insects, and treats comprehensively on the biology of many of the chief members of that kingdom.

There are three main divisions: Part I treats of anatomy and physiology and occupies about one quarter of the book. In Part II the author discusses in the short space of 41 pages, development and metamorphosis under two main headings—"Embryology" and "Postembryonic Development". Part III, the largest section of the book, covering 469 pages, is given over to the classification of insects. The author divides them into Subclass I, Apterygota, comprising the three orders of Thysanura, Protura and Collembola; Subclass II, Pterygota, further separated into Division I, Exopterygota with eleven orders, viz: Orthoptera, Dermaptera, Plecoptera, Isoptera, Embioptera, Psocoptera, Anopleura, Ephemeroptera, Odonata, Thysanoptera and Hemiptera, and, Division II, Endopterygota with nine orders, viz: Neuroptera, Mecoptera, Trichoptera, Lepidoptera, Coleoptera, Strepsiptera, Hymenoptera, Diptera, and Aphaniptera.

An index of important reference works and a good general index in which the illustrations are denoted by heavier typed numerals, completes the volume which consists of 667 pages of text matter, well illustrated by excellent line drawings and photographs.

While it is true that this work deals mostly, if not entirely, with European species, it is nevertheless one which will readily recommend itself to insect investigators of this Continent as a reference book of exceptional merit.

C. B. Hutchings.

Anatomy and Physiology of the Honeybee;—By R. E. Snodgrass, published by McGraw-Hill Book Co., New York, pp. i-xv and 1-327, 107 text figures.

To the many impressive results of the researches of R. E. Snodgrass has now been added the above cited book which appears at a time when the author is richly endowed with unusually extensive experience in the subject covered by his book.

This useful compendium may be frankly recommended for study both to the bee-keeper and to the general reader. To the bee-keeper the whole book should be of interest, being as it is a faithful review of the work of the author himself and his colleagues past and present. The general reader will surely be fascinated by the great array of facts bearing on the physiology of the honeybee as well as by the detailed anatomical studies of this insect. Henry L. Viereck.

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